第25卷 第1期 古脊椎动物学报 PP. 20—31
1987年1月 VERTEBRATA PALASIATICA figs. 1—3, Pl. I

安徽潜山古新世一种似钝脚目的哺乳类

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关键词 安徽潜山 丰齿兽 中古新世

内 容 提 要

本文记述了在安徽潜山盆地中古新世望虎墩组下部发现的一块具完整颊齿的头骨化石，并据此建立了一新科——丰齿兽科 (Plethorodontidae fam. nov.)。包括一新属新种一潜山丰齿兽 (*Plethorodon chienshanensis* gen. et sp. nov.)。根据上颊齿特点，笔者认为它与翼齿兽比较接近，因而暂被放入钝脚目。文中还对这两类动物的有关分类阶元提出了初步意见。

1981年，中国科学院古脊椎动物与古人类研究所安徽野外队[1]，在该省潜山县黄铺镇东南中古新世望虎墩组下部，发现了一具头骨化石，从牙齿形态看，某些特征虽相似钝脚类但又很难归于这一目．经与有关类群比较，笔者认为它代表了接近钝脚类，但目的位置仍不太清楚的一新科。这一发现，不仅为含有丰富哺乳动物化石的潜山盆地古新世动物群增加了新的成员，而且也为研究亚洲早期哺乳类某些"土著"类型的关系提供了有价值的资料。本文在记述这一新科的同时，还对它与其他类群的关系及有关分类阶元问题做了初步的讨论。

高等室早第三纪组同志对我们的研究提供了很多宝贵见解，谢树华同志精心地修理了标本，张杰同志摄制照片，李荣山同志绘制插图，作者在此一并致谢。

? 钝脚目 ? Pantodonta Cope, 1873

丰齿兽科(新科) Plethorodontidae fam. nov.

科的特征 同属的特征。

丰齿兽属(新属) *Plethorodon* gen. nov.

属的特征 个体大小如獾．鼻骨后部扩大，其末端在中部向后突。颧弓粗壮，向外扩张。腭骨比翼齿兽宽得多。上颊齿齿冠外壁凹入不深，无柱尖。附尖发育，前附尖强于后附尖，前翼长于后翼。小尖不发育，次尖架宽。M^1 和 M^2 齿冠轮廓近方形，外脊成U形，无中附尖；原尖粗钝，有明显的次尖.

1) 参加野外工作的除作者外，还有本所计宏祥、陈德旺和范贵忠，以及安徽省博物馆郑龙亭和潜山县文管所余本爱同志。

潜山丰齿兽(新种) *Plethorodon chienshanensis* sp. nov.

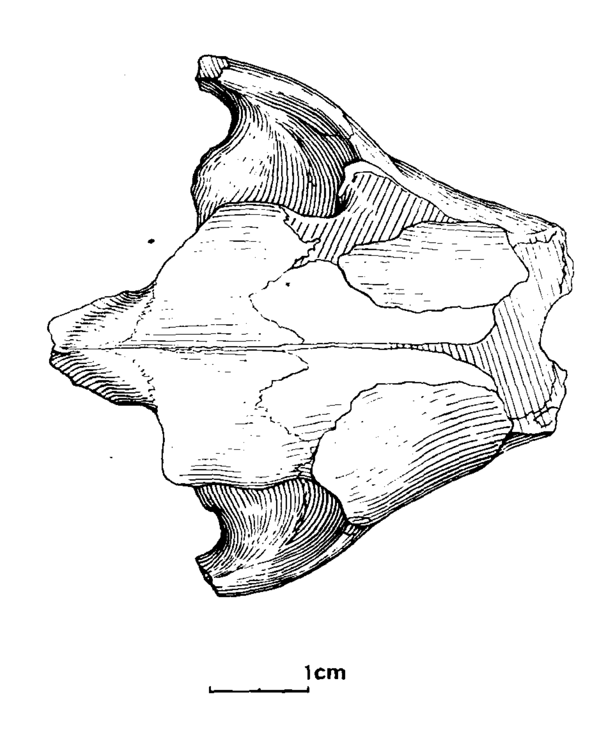
(图版 I, 1—4; 图 1-3)

正型标本　一保存全部颊齿的不完整头骨（V8304）。

地点和层位　安徽潜山黄铺东南汪大屋附近，中古新统望虎墩组下部。

词义　属名表示这类动物的上颊齿前、后齿带发育，M^1 和 M^2 具次尖，冠面近方形，整个颊齿看上去比较丰满。种名以示化石产地.

种的特征　同属的特征。



1cm

图 1　潜山丰齿兽头骨（V8304），顶面观
Fig. 1　The skull of *Plethorodon chienshanensis* (V8304), dorsal view

描述　头骨仅保存前半部，且吻部完全破损，缺门齿和犬齿。鼻骨中部窄，后部扩大变宽成棒锤状，向后伸进眼眶约 10 毫米，末端在其骨体中间。两鼻骨在中部最窄处和后端最宽处的宽度分别约 7 毫米和 19.5 毫米。上颌骨与鼻骨有很长的接触。额骨相对较宽，其前部由于两鼻骨在中间后突，故鼻骨和额骨成交错接触。眶后突大，眶后收缩明显，矢状脊前部平直而尖细。

眼眶中等大小，直径超过 10 毫米．眶缘由上颌骨、颧骨和额骨组成。在右眶前缘的上颌骨和颧骨之间似乎可看到有一窄长形的泪骨。眶前缘位置约在 P^4 后端上方。颧弓比较张开，两颧弓之间头骨的最大宽度至少是 56 毫米。颧骨在前端与上颌骨接触，分两支，上支比下支长得多。眶下孔较大(成卵圆形，最大径约为 4.5 毫米)，位于 P^3 上方，与眶下缘约在同一个水平面上．腭骨稍有挫动，但实际上也相当宽，最大宽度在 M^3 之间，约 20毫米，相当于最宽的牙齿 M^2 的两倍。

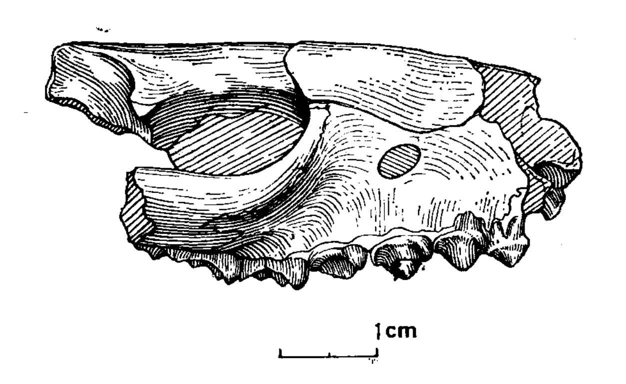


图 2 潜山丰齿兽头骨 (V8304)，侧面观
Fig. 2 The skull of *Plethorodon chienshanensis* (V8304), lateral view

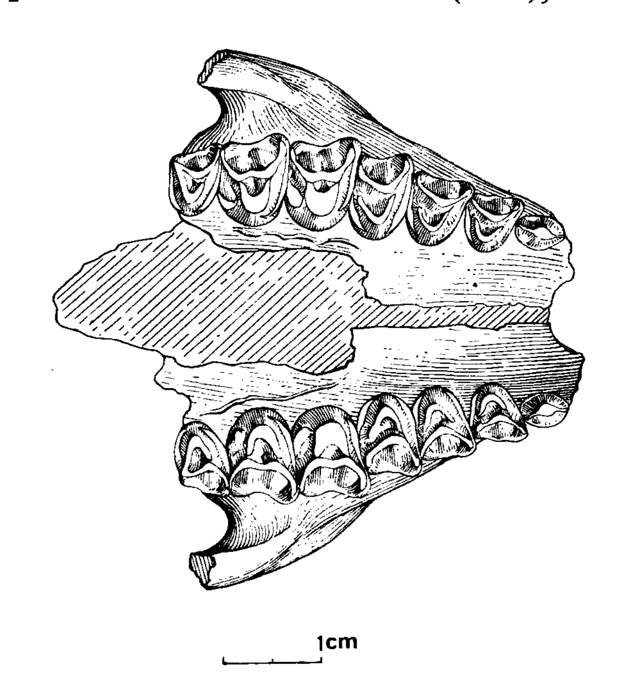


图 3 潜山丰齿兽头骨 (V8304)，腹面观
Fig. 3 The skull of *Plethorodon chienshanensis* (V8304). ventral view

左右齿列均保存 P^1—M^3，牙齿完好无破损。颊齿低冠，紧密排列无齿隙。左右两齿列在 P^1 和 P^2 处近于和头骨长轴平行，从 P^3 起，成轻微的圆弧状，在 M^1 处稍向唇侧突出。

上颊齿(除 P^1 外)前附尖均比后附尖发育，牙齿前缘都长于后缘。从 P^3 到 M^3 前齿带均较发育，而 P^2 到 M^3 后齿带皆宽而明显，上臼齿有很宽的次尖架。外齿带从 P^2 到 M^2 渐趋发育。在所有的牙齿中前、后齿带均在原尖内侧间断。

前臼齿从前向后横向加宽。

P^1 小，双齿根。齿冠前后长，两侧稍压扁，具单一主尖，其位置稍靠前，前后均有弱稜延向齿冠基部。主尖外侧，与后面的 P^2 和 P^3 一样，有宽而低的纵稜，但不伸达齿冠基部。

P^2 具三齿根，齿冠成前翼稍长的亚等边三角形。外侧齿尖粗大，横向侧扁，有明显的前脊和后脊，分别与不太发育的前附尖和后附尖相连，整个外脊略成圆弧形。后附尖弱于前附尖。外壁虽有粗而低的纵稜存在，但仍较平。原尖粗壮，位于牙齿内侧中间稍后，形成V形脊。原尖前脊和后脊长度相等，但前者高于后者，向外伸达前尖前内侧基部，原尖后脊也向外侧伸，但在接近后附尖内侧处即消失。后齿带相当发育，从原尖后内侧一直向外伸延与后附尖后基部相接。

P^3 成横宽的三角形或一端稍尖的椭圆形，前缘稍长于后缘。外中凹较 P^2 深，但仍很浅。前、后附尖尤其是前附尖比在 P^2 中明显。外脊约成V形，前脊较平直，后脊稍凹入。原尖略低于外尖，形成V形脊。原尖前脊高而短，在接近外尖基部有咬合切迹。原尖后脊低而长，在后附尖内侧基部近于消失。外齿带比在 P^2 中明显，前齿带发育但较后齿带窄。

P^4 大于 P^3，更加横宽，外中凹深。外脊和前两前臼齿的一样，成高脊状。前附尖特别发育，粗大，后附尖仍成脊状。其他特征似 P^3，只是更为发育。

M^1 成次方形，前缘微凸，后缘稍平。外中凹较 P^4 的深而开阔。外脊成U形，向内延伸达牙齿宽度之半。前尖和后尖明显分开，但较紧靠，均成三角锥状，外壁较平，内壁稍突，两尖大小接近或前尖略大于后尖，两尖之间有低而短的中央稜相连。前脊比后脊略长，但自前尖向前附尖延伸变低的程度比后脊明显。前附尖特别高大，后附尖也很发育，此两尖比在其他任何牙齿中都强。前附尖的后外侧和后附尖的前外侧之间的外齿带很发育，成中部稍凹的低脊状。原尖特别粗钝，次尖低而小，两尖之间在冠面顶部有凹槽，但稍向下一直到齿冠基部两者相连，致使牙齿内侧面平而长。次尖架很宽，最宽处在原尖和三角凹的后侧。前齿带比前臼齿的宽，最宽处在三角凹的前侧。

M^2 的大小和形态似 M^1，但较短宽，外中凹稍窄长，前附尖未重迭在 M^1 后附尖之外，前尖较明显地大于后尖，前脊中部下凹比 M^1 中为强，此脊从前内侧看似成圆弧形。次尖尚未磨蚀，成圆锥形，位于原尖后外侧。亦无柱尖。

M^3 约成斜三角形，外缘斜向后内方。前缘比后缘长得多。外中凹比前两臼齿的浅，约成以前尖为顶的三角凹，其前、后缘均微凸。前尖与前两臼齿的同，后尖位于后外角，比前尖小得多，无后脊和后附尖。中央稜较长，斜向后外方。外脊略成V形，由前脊和中央稜组成。原尖不如 M^1 和 M^2 的粗钝，似 P^4。原尖后脊延向后尖基部；原尖前脊在与前尖基部相连处有一明显的咬合切迹，原尖前脊末端有膨大的迹象。前附尖、外齿带较弱；但前、后齿带均很发育，长而不宽，在原尖内侧不连接。无次尖、柱尖。后齿带低而平，伸向后尖的后内基部，具瘤状突起。

从保存的标本看，颊齿磨蚀面主要表现在原尖及其前、后脊的顶面，外脊的内侧面和前、后齿带。

比 较 和 讨 论

新属上臼齿的前、后齿带很发育，次尖架宽，M^1 和 M^2 的舌面较长，冠面显得方，这些特点与裂齿目（Tillodontia）很相似。但经过详细比较，我们的标本在其他一些特征上与裂齿目差别很大。就现有资料看，裂齿目仅有一科，分为两个亚科，约包括 10 个属。其

表1　潜山丰齿兽（*Plethorodon chieshanensis*）的牙齿测量（V8304）（单位：毫米）

牙齿		P^1	P^2	P^3	P^4	M^1	M^2	M^3
长		4.1—4.2	5.2—5.4	5.4—5.5	5.5—5.6	6.7—6.9	6.8—7.0	5.2—5.4
宽	（前缘）	2.7—2.8	5.9—6.0	7.2—7.5	8.5—8.6	9.2—9.5	9.9—10.3	8.0—8.2
	（后缘）		5.0—5.1	7.0—7.2	7.2—7.5	8.2—8.5	7.5—8.0	5.9—6.0
宽(前缘)/长×100		64—68	109—115	131—139	152—156	133—142	140—152	148—158
宽(后缘)/长×100			93—98	127—133	129—136	119—127	109—118	109—115
$P^1-M^3=39-39.5$			$P^1-P^4=21.4-21.7$			$M^1-M^3=18.9-19.4$		

晚期的种类特征显著，与新属有相当大的区别。如它们的齿式不全（缺上、下第一前臼齿），上、下第二门齿增大并趋向于无根，颊齿单面高冠，成双曲拱柱状，基本上是丘形齿。至于在早期的原始种类中，新属同样与它们也很不同。如最古老的裂齿类是发现在我国南雄盆地古新世的罗佛寨兽（*Lofochaius*），尽管两者有些特征有所相近，但罗佛寨兽的上颊齿基本上是丘形齿，且上臼齿相当横宽。而时代稍晚的在湖南茶陵盆地发现的小尖兽（*Meiostylodon*），其上臼齿的脊形程度也远不如新属强，且脊的连接形式也不同，它的上臼齿已初具单面高冠。鉴于上述这些重大区别，新属难于归入裂齿目。

新属与某些早期偶蹄类如欧、亚和北美的古偶蹄兽（*Diacodexis*）也有一定相似之处，该属中最原始的种，早始新世的 *D. secans*，在个体大小，颊齿某些性质（原尖特别粗壮，前、后齿带相当发育，上臼齿齿冠近方形，有发育的次尖等）方面均与我们的标本相近。但两者的差别也相当显著，该种的 P^3 特别细长；P^4 外尖为单尖，粗而圆钝，不构成V形脊；上颊齿无外架，前、后附尖不很发育，整个牙齿的脊形化程度也比潜山的标本弱得多。

踝节目中有些类群，它们的上颊齿前、后齿带也很发育，上臼齿轮廓近方形，有发育的次尖。但它们的齿脊或相当发育，或仍是丘形齿。如古踝节兽（*Meniscotherium*）包括 M^3 在内的整个上臼齿外侧齿脊均相当发育，前、中、后附尖与前、后尖一起，甚至连前、后小尖也都构成类似牛、和鹿科等偶蹄类式的新月形脊。而另一类，牙齿脊形化程度相当弱，基本上仍是丘形齿，如时代仅局限于古新世的原始类群熊犬科（Arctocyonidae）就是代表。除少数类群如原蹄兽（*Phenacodus*）等外(但该动物上颊齿无外架)，大多数踝节目的原尖均不构成V形脊。因此，很难将潜山标本归入踝节目。

在早期较原始的哺乳类中，唯钝脚类与新属有较多的重要的共同点，可能它们之间有比其他类群更为接近的亲缘关系。这表现在它们的颊齿都为较强的脊形齿，均具完全齿式，上前臼齿特别是 P^3 和 P^4 具有完全的或不太完善的双V形，M^3 小，后尖、后脊和后附尖均退化。在有些科中（如翼齿兽科）M^1 和 M^2 的外脊也和新属一样，不成W形而成U形，且无中附尖。

近20年来，由于新材料的不断发现，使钝脚目成为相当丰富而复杂的类群，目前约包括9科20多属动物。其中北美古新世有三个科[1]——全脊兽科（Pantolambdidae）、厚脊齿

1）虽然有人（Van Valen, 1978）将它们并为一个科——全脊兽科，也有人(Gingerich and Childress, 1983）把它们作为全脊兽科的三个亚科，但本文仍依 Simons（1960）等人的观点，视为三个独立的科进行比较。此外，星期天兽科（Cyriacotheriidae Rose and Krause, 1981），由于其前臼齿过分臼齿化等特点，目前分类位置有争论。

兽科 (Barylambdidae) 和巨脊齿兽科(Titanoideidae)。而亚洲钝脚类有古新世的阶齿兽科 (Bemalambdidae)，古新世到始新世的翼齿兽科 (Harpyodidae)、古脊齿兽科 (Achaeolambdidae) 和牧兽科 (Pastoralodontidae)，始新世的全稜齿兽科 (Pantolambdodontidae)[1] 以及欧亚大陆和北美始新世—渐新世的冠齿兽科 (Coryphodontidae).

目前钝脚目尤其是亚洲类群，迄今仍缺少详细深入的研究，相互之间的系统关系并不很清楚。尽管这样，但是各"科"在形态上是各具特色的，新属与它们相比，均有一定的差别。

新属的头骨横宽，颊齿从前到后增大，与北美钝脚类有所相似，尤其是与厚脊齿兽科较为接近，这表现在：它们的 P^3 和 P^4 的原尖成完全的V形，上臼齿冠面成矩形或近似方形，有发育的前、后齿带和次尖架等。但厚脊齿兽科的上臼齿前、后尖分开较远，有大的中附尖，外脊成W形，稍向内延伸，仅大约占据牙齿宽度的三分之一，M^3 的外脊成不太完善的W形等特点均不同于新属。新属与巨脊齿兽科的区别还在于后者的上前臼齿原尖不成V形、上臼齿的前、后齿带均不发育、无次尖架、冠面视基本上成三角形等特点。

新属个体小，在所有钝脚类各科中，仅比翼齿兽稍大。与亚洲钝脚目的几个科相比，它们的上臼齿外架宽，前、后尖较靠拢，M^3 外脊成V形，均与新属相似；然而，它们之间在其他特征上仍差别很大。

阶齿兽科后面的上前臼齿原尖成V形，上臼齿具前、后齿带，W形外脊不明显，无中附尖等特点似与新属相近，但该科的上颊齿尤其是上臼齿特别横宽，前、后齿带不算很发育，无次尖和次尖架，显然在形态上与新属很不同。

全脊齿兽科出现的时代晚，个体大，已知头骨和上颊齿的材料相当少。从最近丁素因等 (Ting et al., 1982) 报道的在宁夏发现的标本看，无论头骨(尤其是鼻骨)或颊齿结构均与新属相差甚远。

新属与牧兽科相比，它们的 M^1 和 M^2 均具发育的次尖架，牙齿内侧长，成矩形或近似方形。但是，后者的 P^2 小而简单，P^3 和 P^4 的两个半月脊与前者的V形脊在形态和位置上都有一定的差别。此外，牧兽科的上臼齿具发达的中附尖，外脊成明显的W形，均很不同于新属。

至于古脊齿兽科，除了个体大，前颌骨特别长外，其上颊齿的形态与新属也有很大的区别。如古脊齿兽科动物后面两个上前臼齿的原尖V形脊不完全发育，原尖后脊有中断现象，上臼齿前、后齿带不发育，无次尖架和次尖，牙齿冠面成亚等边三角形等。因此，尽管新属在大小上相对接近古脊齿兽，但两者之间在系统上似无多大联系。

然而，在钝脚目中，新属与翼齿兽相比，却有许多相似的特点。它们的颧骨与泪骨接触，在面部出露，眶后突明显，矢状脊细而平直。颊齿紧密排列，脊形化程度强。P^1 双根，

1) 关于亚洲钝脚目的分类，目前各家的意见还很不一致。以往不少学者(如 Flerov, 1952; Kielan-Jaworowska, 1969; 黄学诗, 1978)均认为古脊齿兽科是个独立的科。而周明镇、齐陶(1978)在"内蒙古四子王旗晚古新世哺乳类化石"一文中，最后附带提到了古脊齿兽科是全脊齿兽科的同物异名。周明镇、王伴月(1979)将古脊齿兽科包括在全脊齿兽科中。还有人(如 Lucas)则认为这后四个科应归成一个科——全脊齿兽科，下分两个亚科——翼齿兽亚科 (Harpyodinae) 和全脊齿兽亚科 (Pantolambdodontinae)。这后一亚科包括了原来的全脊齿兽科、古脊齿兽科和牧兽科三科的成员。

单尖。P^2 和 P^3 冠面成三角形或椭圆形。后面的上前臼齿外脊和原尖脊成双V形。前面两个上臼齿外脊成U形，向内伸达牙齿宽度之半。不具中附尖。前齿带从 P^2 到 M^2、后齿带从 P^3 到 M^2 均相当发育，并愈向后愈显著，次尖架宽。在 M^1 和 M^2 中形成明显次尖，牙齿冠面成矩形或近似方形。M^3 的前、后齿带也很发育，后齿带具瘤状突起，外脊成斜V形。但是，两者之间的差别也相当显著。翼齿兽的上颊齿较横宽，除 M^3 外，均后附尖强于前附尖，后翼长于前翼，外缘凹入深，有柱尖。M^1 和 M^2 的中央稜稍弯曲。M^2 的前附尖在 M^1 后附尖之外有重叠现象。原尖较尖锐，其前、后原尖脊V形夹角相对小，且原小尖和后小尖发育，并具前、后臂。M^3 有短的后脊和明显的后附尖，V形外脊由前脊、中央稜和短的后脊共同组成，外缘有瘤状柱尖。而新属的上颊齿特别是上臼齿相对窄长，冠面轮廓显得方，外缘凹入不深，无柱尖，前附尖强于后附尖，前翼均长于后翼。M^1 和 M^2 的中央稜低而直，原尖特别粗而圆钝，原小尖和后小尖均不发育。M^3 无后脊和后附尖，V形外脊仅由前脊和中央稜组成。此外，在头骨上，翼齿兽科的细长，腭骨窄，而新属头骨从保存的前部看，是很宽的，腭骨也宽，鼻骨在后部扩大。

上述比较表明新属尽管与钝脚目尤其是翼齿兽科较为接近，但实际上很难归于该目已知各科，我们认为将潜山这一新标本定立一个新科是适当的，并订名为丰齿兽科。

翼齿兽科的化石最早发现于安徽潜山盆地中古新世望虎墩组中上部。邱占祥和李传夔(1977)根据三个不完整的上臼齿，建立了翼齿兽属(*Harpyodus*)，种名为东方翼齿兽(*H. eures*)。他们经过比较，将其放入三角齿兽目 (Deltatheridia)，认为最接近 Deltatherinae 亚科中的代表。然而该亚科的齿式尚有疑义，其他特征也与翼齿兽有很大区别，因此原作者认为翼齿兽的分类位置尚难确定。王伴月(1979)报道了发现在江西池江盆地晚古新世池江组烂泥坑段的一块较完整的头骨，命名为华美翼齿兽(*Harpyodus decorus*)，并根据翼齿兽一些独特的性质，建立一新科一翼齿兽科。她将该科与早期原始的哺乳动物一有袋类、Palaeoryctidae (分类位置有争议) 及钝脚类进行了详细地比较，认为与翼齿兽科最接近的还是钝脚类，这主要表现在颊齿为脊形齿，上前臼齿为双V形，上臼齿原尖成V形，外脊为发育程度不同的W形(实际上翼齿兽为U形外脊)。因此，她将翼齿兽从原认为的三角齿兽目中移到钝脚目。

如上所述，翼齿兽和丰齿兽是两类古老而又相似的类群，它们既接近于又不同于钝脚目。它们的个体小，上颊齿均具发育的前、后齿带，牙齿冠面相对方，P^1 双根，P^2 成三角形，上臼齿的外脊成U形，其前、后尖成扁锥形或三角锥形，具发育的次尖架和次尖等。这些特点几乎不同于钝脚目中的所有已知科。然而翼齿兽和丰齿兽之间尽管有不少的差别，但这种差别不如它们与钝脚类其他科大，且两者之间存在很多重要的共同点。因此，我们认为翼齿兽和丰齿兽之间似有较近的亲缘关系，有可能这两科动物代表着亚洲早第三纪至今还不知道的一个新类群。由于这两类动物目前发现的材料很少，其真正的性质和系统关系并不清楚，建立更高一级的分类阶元似乎为时过早，所以本文暂将丰齿兽放在钝脚目中。

(1986 年 8 月 18 日收稿)

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A NEW PANTODONT-LIKE MAMMAL FROM THE PALEOCENE OF CHIENSHAN BASIN, ANHUI

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Key words Chienshan, Anhui; Middle Paleocene; *Plethorodon*

Summary

An incomplete mammalian skull with all the cheek teeth present in the Middle Paleocene Lower Member of Wanghudun Formation, Chienshan Basin, Anhui Province, was collected by an IVPP field team in 1981. The cheek teeth share several important features with those of Pantodonts. Nevertheless, the similarities do not warrant referring the teeth to the Order Pantodonta. The specimen is here treated as a new family, being tentatively placed in Pantodonta. The discovery of this find is significant in that it not only adds a new member to the rich Paleocene Fauna of Chienshan Basin, but it also provides new material regarding the endemic Asiatic mammalian groups.

? Pantodonta Cope, 1873
Plethorodontidae fam. nov.

Diagnosis Same as for the new and only genus — ***Plethorodon.***

Plethorodon gen. nov.

Diagnosis Small mammals about the same size as a badger. Skull comparatively broad with nasal bones enlarged posteriorly. Zygomatic arches robust and expanded laterally. Palatine rather wide. External margin of upper cheek teeth slightly curved inward; parastyle stronger than metastyle and the anterior margin of the tooth is longer than the posterior one; pre-, posr- and ecto-cingula well developed on nearly all the cheek teeth except P^1; M^1 and M^2 *roughly quadrate in outline and have U-shaped ectolophs with no mesostyles, having robust* protocones and distinct hypocones.

Plethorodon chienshanensis sp. nov.

Type An incomplete skull with all the cheek teeth present (V8304).

Horizon and locality Lower Member of Wanghudun Formation, Middle Paleocene; Huangpu, Chienshan County, Anhui Province.

Diagnosis Same as for the genus.

Description

Skull The front half of the skull is intact, although the muzzle is broken. The nasal bones are narrow (7mm) in the middle and broad posteriorly (19.5 mm). The maxillo-

nasal suture is long and the frontals are relatively broad. The orbital process is prominent. The preserved anterior portion of the sagittal crest is thin and elongate. The orbit is medium-sized, oval in shape, and over 10 mm in diameter. The orbitalis margin comprised mainly of maxilla, zygoma and frontal bones. The anterior orbital margin is placed above the posterior end of P^4. The zygomatic arch expands laterally; the width between the arches is at least 56 mm. The jugal is in contact with the maxilla anteriorly, dividing the former into two branches, the upper one is much longer than the lower. The infraorbital foramen is comparatively large, placed above P^3, and the inferior margin is in the same horizontal level as the inferior orbital margin. The palate is widest between M^3, where it measures 20 mm.

Upper cheek teeth The upper cheek teeth are perfectly preserved in the specimen. They are low-crownd and closely appressed. The cheek tooth rows are parallel at P^1 and P^2, and become somewhat circular from P^3 to M^3 with the convex side outward facing at M^1. The parastyle in all the cheek teeth except P^1 is more developed than the metastyle and the anterior margin of the teeth is longer than the posterior one. The pre- and ecto-cingula from P^3 to M^2 and the post-cingulum from P^2 to M^3 are increasingly developed, wide and pronounced. The pre- and post-cingula are not connected the inner side of the protocone in all teeth.

P^1 is small, double-rooted, the crown of which is compressed transversely, with a single cusp and with weak crests extending forward and backward.

P^2 is triangular in outline and is about as long as it is broad, and it has three roots. The ectocone (parametacone) is big and robust, compressed transversely, with a prominent paraloph and metaloph joining the parastyle and metastyle, respectively. The whole ectoloph appears to be circular. The external wall is slightly concave inward although there is a lower and robust vertical crest. The protocone is robust and forms a V-shaped loph. The preprotocrista is as long as but higher than the postprotocrista.

P^3 is triangular or nearly elliptic in shape and more transverse than P^2. The protocone is lower than the ectocone. The angle of the pre- and post-protocrista is smaller than that of ectoloph which also forms a V. The preprotocrista is higher and shorter, indented by a notch near the base of ectocone, while the postprotocrista is lower and longer, extending to the inner base of the metastyle.

P^4 is larger and wider than P^3. The external wall is curved inward, deeper than the preceeding premolars. The ectoloph is very high. Other features are similar to those of P^3 but more well-developed.

M^1 is rectangular or nearly quadrate in outline. The ectoloph is U-shaped with no mesostyle, and extends inward about half of the width of the tooth. The paracone and metacone are separate, but close together, conic in shape, flat buccally and slightly convex on the lingually. The two cusps are nearly equal in size with the paracone slightly a bit larger than the metacone. The centrocrista is straight, low and robust. The protocone is much more robust, while the hypocone is lower and smaller. The hypocone shelf is very wide, so the inner wall of the tooth is rather long anteroposteriorly.

M^2 is close to M^1 both in size and in morphology but transversely wider. The paracone is big than the metacone in comparison with M^1. The hypocone is unworn, situating in the posteroexternal side of the protocone.

M^3 is obliquely triangular in shape with anterior margin much longer than the posterior one. The paracone is larger than the metacone. The metaloph is so reduced that the roughly V-shaped ectoloph consists mainly of paraloph and relatively long centrocrista. The metastyle

is absent. The protocone is less robust than that in M^1 and in M^2, but nearly equal to that of P^4. Like those in the first two molars, the protocone is also V-shaped, but preprotocrista is cut by a distinct notch near the base of the paracone. The post-cingulum is lower and has tubers on it. No hypocone is present.

For the measurements see Chinese text.

Comparison and discussion

The morphology of the new Asiatic genus, *Plethorodon,* and the new family Plethorodontidae, is similar to that of Pantodonta in some respects, such as tooth formula, lophodonty, double V-shaped posterior upper premolars and small M^3 with the metaloph and metastyle much reduced.

Recent discoveries of Pantodonts have enlarged our understanding of the complex morphology of this group. Up to the present, nine families (except Cyriacotheriidae, whose systematic position is under disputed) and over 20 genera of this order have been recognized by different authors: Pantolambdidae, Barylambdidae, and Titanoideidae in the Paleocene of North America; Paleocene Bemalambdidae, Paleocene to Eocene Harpyodidae, Archaeolambdidae and Pastoralodontidae, Eocene Pantolambdodontidae in Asia; and Eocene to Oligocene Coryphodontidae found in both Eurasia and North America.

Plethorodon differs from all the North American Paleocene Pantodont genera in its small size, nearly quadrate outline of M^1 and M^2 with a U-shaped ectoloph, no mesostyle, and a V-shaped ectoloph on M^3. In contrast to *Plethorodon,* Bemalambda has much wider upper cheek teeth, much weaker pre- and post-cingula, and no hypocone or hypocone shelf on the upper molars in addition to its large size.

Plethorodon differs from representatives of Archaeolambdidae and Pastoralodontidae in its smaller size, well-developed V-shaped protolophs on the posterior upper premolars, more quadrate M^1 and M^2 and U-shaped ectoloph with no mesostyle.

Pantolambdodontidae is of large size, of later geological age, the material of whose skull and upper dentition is very rare. Recent discovery (Ting et al., 1982) from Ningxia shows this family is greatly different from Chienshan specimen both in skull (especially nasal bones) and tooth morphology . The differences both in size and in morphology between Coryphodontidae and the new form are so great that close affinity between them is also impossible.

Of all the families of Pantodonta, *Plethorodon* is most similar to Harpyodidae in its possession of a double-rooted p^1 with a single cusp; P^2 triangular in shape; ectoloph and protoloph form a double V crests on the posterior upper premolars; U-shaped ectoloph with no mesostyle, but extending inward about half width of the tooth on M^1 and M^2, which have distinct hypocones and wide hypocone shelves; M^3 has a V-shaped ectoloph, much reduced or no metaloph and metastyle, and a posterior cingulum with some tubers. The two forms, however, still have some important differences: The upper cheek teeth (except P^1 and M^3) in Harpyodidae have a shorter anterior margin than the posterior one, and the ectoflexus is very deep. On M^1 an M^2 the centrocrista is somewhat bent. The parastyle of M^2 is well developed and overlapped on the external side of the metastyle of the preceeding tooth. The protocone is thinner and higher, and the angle of V-shaped protoloph is comparatively small. There are stylocones on the buccal edge of the upper molars as well as paraconules and metaconules on the protolophs. All of the above features of Harpyodidae are different from those of *Plethorodon.*

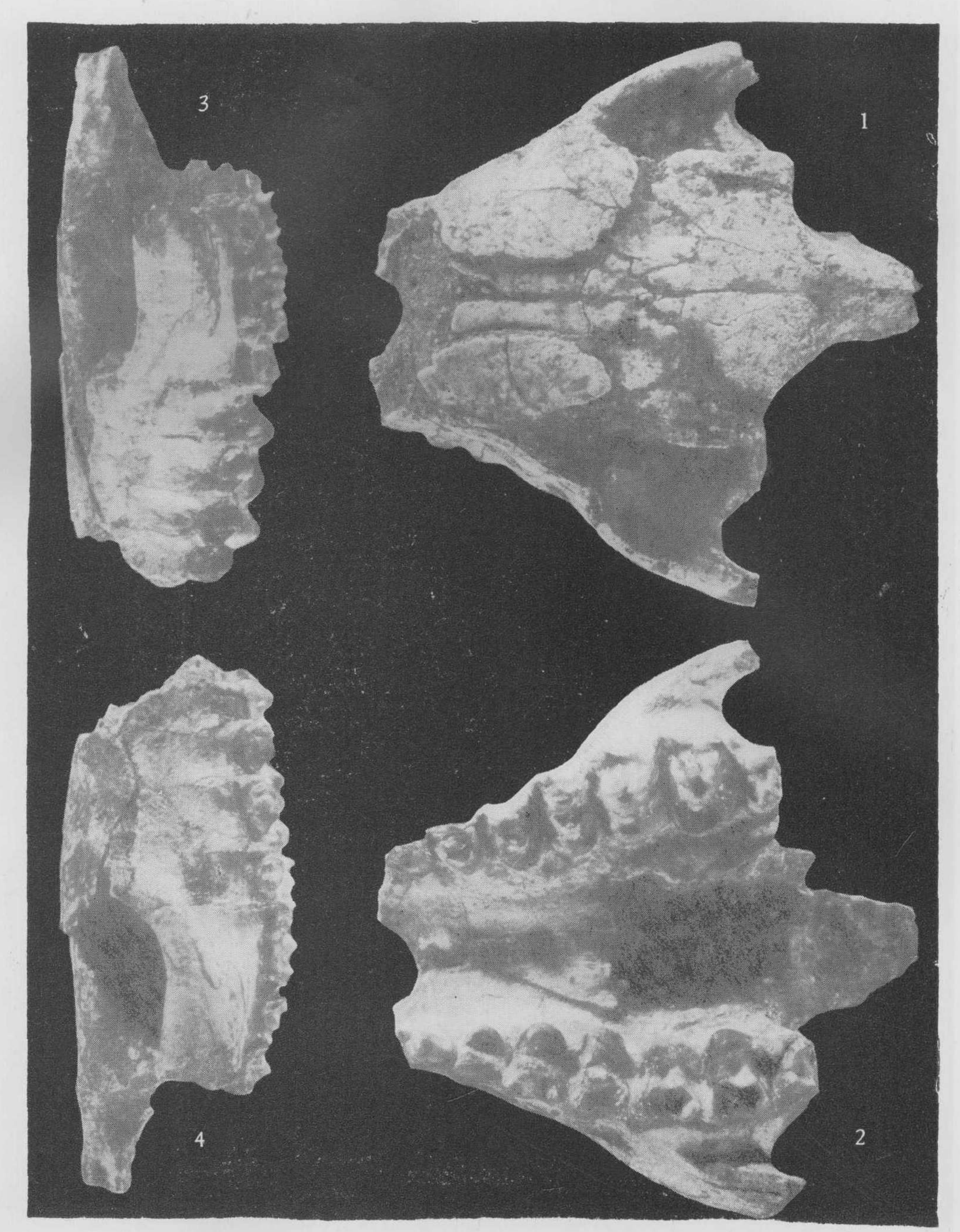
From above comparison, the new genus, *Plethorodon,* can not be referred to any family of Pantodonta, including Harpyodidae. Therefore, we propose a new family, Plethorodontidae, for this material.

Apart from Pantodonta, Plethorodontidae is similar in some morphological features to Tillodontia among the early mammals. The characters, such as well developed pre- and post-cingula, wide hypocone shelf and nearly quadrate outline of M^1 and M^2, are shared by Plethorodontidae and Tillodontia, but the latter are more specialized. The later members of Tillodontia lack first upper and lower premolars, the second (upper and lower) incisors become enlarged and rootless, the cheek teeth are unilateral and seem to be double arches (vertical and horizontal, especially in the lower molars). Even in the early primitive representatives, like *Lofochaius* found in the Middle Paleocene Nanshiung Basin, Kwangtung and *Meiostylodon* in the Late Paleocene of Chaling Basin, Hunan, the above features appear, and the teeth are essentially bunodont. The differences are so great that Plethorodontidae is therefore difinitely precluded from Tillodontia.

Some similarities in the upper cheek teeth between Plethorodontidae and certain early Artiodactyla (Like *Diacodexis*) as well as Condylarthra appear to be convergent.

Harpyodidae were initially found in the Middle Paleocene of Chienshan Basin. *Harpyodus eures* was created by Qiu and Li (1977) based on three incomplete upper molars. They referred this species to Deltatheridia with uncertainty. Two years later, Wang (1979) described a more complete skull from the Late Paleocene of Chihkiang Basin, Kiangxi Province and created a new species, *Harpyodus decorus*. She thought *Harpyodus* is closer to Pantodonta than to other orders of mammals, as a result of comparison with Marsupialia, Palaeoryctydae and Pantodonta. She established a new family, Harpyodidae, for *Harpyodus* of the order Pantodonta.

Harpyodidae and Plethorodontidae are both very small, have more developed pre- and post-cingula on the upper cheek teeth, double-rooted P^1, P^2 triangular in shape, nearly quadrate outline of M^1 and M^2 with U-shaped ectolophs and no mesostyles, as well as other common features mentioned above. This evidence demonstrates that not only the two families seem to be phylogenetically distinct from Pantodonta, but they are closely related to each other. Harpyodidae and Plethorodontidae may represent a new taxon (i.e. order) of Asiatic early mammals heretofore unknown.



潜山丰齿兽（*Plethorodon chienshanensis* gen. et sp. nov.）头骨（V3304）

1.顶面观； 2.腹面观； 3.左侧面观； 4.右侧面观。均×1